Public Report for Valero Paulsboro (ESA-051)

Introduction:

Valero is a refiner of crude oil to produce fuels and lubricants. The Paulsboro plant processes approximately 67,160,000 barrels of crude /yr. The plant is located on a 950-acre site located on the shore of the Delaware River.

Objective of ESA:

The focus of this ESA is to teach the members of the energy services department the use of the SSAT software.

Focus of Assessment:

Run some sample projects to with key personnel to familiarize them with the use of the software.

Approach for ESA:

Tour a unit of the plant and review provided data on the system. Explain the limitations of the software as the facilities steam system is too complex to model completely. Develop strategies to accurately model selected projects. Have key personnel complete the same projects in their own version of SSAT and discuss results. Additional uses of the software and strategies for its use will also be discussed.

Because of the complexity of the system, a number of models were made. The boiler house was modeled by using the 900 lb boiler outlet as the highest pressure and the 400 lb and 190 lb lines, so that the main backpressure turbines could be modeled. Eliminating or turning down the backpressure turbines was looked at, but was found to cost ineffective.

The exact steam states in the headers could not be achieved in the main turbine model due to the turbine operation (desuperheaters in the turbine outlets rather than in the PRV lines.) It was noticed that there was enough PRV let down in the system, so that the trap, leak and use reduction could be made without impacting the turbine operation, so a model was created that accurately modeled 900 lb, 400 lb and 190 lb steam states. The savings for the traps, leaks and steam use reduction were taken from this model.

The condensing turbines provided a particular challenge to model in SSAT as they are fed from the 400 lb lines and not the 900 lb main line. The method used was to design a simplified 400 lb system, calculate the steam savings and electricity use, and then insert the 400 lb steam savings from turning off one of the condensing turbines into the main 900 lb model. The cost savings for the NG and water use reduction were taken from the main system model and the cost increase due to increased electricity use was taken from the 400 lb model.

It was acknowledged that there was some error in these numbers due to the imperfections in the models, but the plant personnel seemed pleased with the results and agreed that the numbers were good enough to warrant further inspection into the various projects.

General Observations of Potential Opportunities:

- Natural gas is the impact fuel at $8.58/MMBtu as of March 2006. The plant does burn some low sulfur diesel fuel when it is less costly than NG. They also burn a large quantity of refinery gas, but do not put a cost number to it. Electricity is purchased at $0.100/kWh as of March 2006
    - The plant is already in the process of improving the steam leak and trap maintenance program. As such, these savings should be realized in the very near term.
    - It was noticed on a process line in the crude processing area that the steam trace traps were operating much more frequently that would be expected. This indicates that there is a problem with either the insulation or the process itself. As this may be a process issue, this project will be done in the very near term.
    - Improving the condensate return rate has been an issue for some time. However, as the plant is so disperse, it will take some engineering to determine how and where to collect the collect the condensate. The project will begin near term, but will likely take longer than the other near term projects, so should likely be considered a medium term opportunity.
    - The condensing turbines are a known issue. However, the size and variable operation the cost to replace them was considered too high. However, the large savings available from the removing them may get the situation revisited. Although the payback period (1.28 years) would put this project in the medium term category, the time required to get buy in from corporate for the capital will likely push the project out into the long term category.

- Estimate of % plant natural gas savings from a) Near Term opportunities; b) Medium Term opportunities, c) Long Term opportunities.
    - 1.9% reduction in natural gas use from near term projects

- 1.1% from medium term projects
- 13.1% from long term projects

Management Support and Comments: The tool should be useful for modeling individual operations units. This will better allow the company to assess the impact and payback of individual energy projects.

DOE Contact at Plant/Company: Dave Land, **dave.land@valero.com**, 856 224-4474